

*Application for*  
**UNITED STATES LETTERS PATENT**

*Of*

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**AND**

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*For*

**PAINTBALL TARGET RANGE**

## **Paintball Target Range**

### **BACKGROUND OF THE INVENTION**

### **FIELD OF THE INVENTION**

The invention generally relates a paintball shooting system for facilitating the practicing or playing of paintball markers(guns) include, alone or in combination, a target subsystem, a paintball marker firing subsystem, a paintball dispensing subsystem, and a range cleaning subsystem, and a range transporting subsystem. In particular, the target range can be fixed in one location or moveable to different location by being loaded on a trailer.

### **DESCRIPTION OF RELATED ARTS**

Being fast paced and competitive, fun and safe, paintball is one of the fastest growing sports in America with more than seven million participants.

U.S. Pat. No. 3,884,471 describes a shooting gallery including a gun pivotally mounted on a board connected with the targets which are hit via concealed pneumatic means rather than any pellets. In this case, there is no pellet to be shot or re-loaded, and there is not any paintballs to be cleaned or loaded after shooting. The gun is pivotally fixed to the board to actuate the pneumatic means, rather than being selectively connected to one air tank for air-powering the paintballs and being restraining by a respective air hose pipe and a tether connected to a barrel of the marker.

U.S. Pat. No. 1,929,327 describes a shooting game system which feeds the guns with recycled missals D which were conveyed by the conveyors 58 into the nozzle 52 then to the guns. The game is started after a coin is inserted and reset after all targets are hit. The system only counts the number of missals D which hit targets rather than the numbers of missals D loaded to the guns. U.S. Pat. Nos. 4,185,824 & 4,215,867 show a similar conveying mechanism for recycling rubber balls which only counts the number of balls hit on the targets rather than the number of balls being dispensed.

U.S. Pat. No. 5,251,906 described a revolving turnable 19 for receiving balls 11 falling downwardly after striking the target 12 and dispensing the balls 11 one at a time through an outlet 21 into the tube 18. The balls are driven up and through the tube 18 by a pinch wheel 22 working off motor 23. Since the balls are recycled, there is no need for a big tank to hold

and dispense new balls. On the other hand, paintballs are not recyclable such that there is need for a big tank.

U.S. Pat. No. 5,839,422A provides a portable automatic projectile loading device for only one gun-like apparatus utilizing compressed gas to fire projectiles. The device stores up to 1000 projectiles and a compressed gas cylinder are carried by the user in a backpack. All projectiles inevitably go to the same gun. There is not a projectile dispensing system to dispense projectiles to a plurality guns or a projectile counting mechanism to count the number of projectiles dispensed to each of the guns. The following patents share the same deficiencies. U.S. Pat. No. 5,816,232 uses a rotatable paddle positioned in the interior space forces paintballs out of the loader housing to drop into a vertical outfeed tube. Rather than counting dispensed balls, when the stack is fully replenished, a sensor will detect the presence of a paintball at the specified location and deactivate the motor, thereby stopping the paddle. U.S. Pat. No. 5,954,042 feeds paintballs into the firing chamber of the paintball gun against (rather than following) the force of gravity. The loader includes a mechanically driven rotating paddle wheel that moves the individual paintballs upward and out of the loader housing and into a feed tube.

U.S. Pat. App. No. 2002/0096163 shows a bulk loader for supplying paintballs to a paintball gun. The loader has a housing with a bottom outlet, a feed tube connected to this housing at the outlet, a paintball moving device for vibrating the housing so as to move paintballs located near the bottom outlet, a switch mounted in or adjacent to the feed tube for sensing the absence of a paintball within the feed tube. The loader is designed only to feed a gun and be moved along with the gun, and it has no means for counting dispensed paintballs. Rather than a vibrating mechanism, U.S. Pat. App. No. 2003/0127084 applies a priming carrier 42 sequentially rotating a limited number of paint balls 40 into an empty space 38 automatically, and a feed carrier 43 having five paddles for directing the paint balls 40 into the firing chamber 17. The carriers are designed only to feed a gun and have no means for counting dispensed paintballs. U.S. Pat. Nos. 6,467,473 and 6,488,019 provide a feeder for feeding paintballs to a paintball gun which includes a first compliant moveable component, such as a rotating disk or conveyor belt, and a second compliant or non-compliant surface such that the paintballs are frictionally engaged between the first moveable component and the second component. U.S. Pat. No. 5,791,325 rotates an agitator with two arch wires extending from its main shaft during a rapid firing sequence to avoid jamming balls in the loader and to reduce undesired noise.

U.S. Pat. No. 6,481,432 shows a paintball hopper with counter mechanism which includes a timer and an LCD display so the user can see how many paintballs have been launched and monitor time. However, all paintballs inevitably go to the same marker. There is not a dispensing system to dispense paintballs to a plurality makers or a paintball counting mechanism to count the number of paintballs dispensed to each individual marker.

U.S. Pat. No. 6,532,946 interconnects a cleaning ball storage and feeding device between a hopper and a loading tube for selectively feeding cleaning balls into the barrel to purge the barrel from shell particles and filler paint deposited from a previously propelled ruptured paintball. However, it merely cleans the barrel rather than any shooting range.

U.S. Pat. No. 6,162,057 shows a movable shooting range within a trailer with fans, filters, air conditioning, light weight, hardened alloy ceilings, floors and side walls. At the forward end of the trailer, a control booth has electronic controls and equipment which allows a range operator to monitor the shooting performance of any person shooting from shooting stalls mounted within the trailer. However, the shooting range was designed for shooting with frangible ammunition rather than paintballs. In addition, the flooring of the trailer is simply flat and with rubber-type matting for comfort and sound absorbing qualities, rather than other shapes for easily paint-cleaning.

U.S. Pat. No. 3,802,705 describes a portable trailer support platform has cannons 50 on both side of the platform which fire projectiles 80 to the targets 120 on the other side of the platform. The projectiles are recycled via the inward slanted floor 36 and a vertical conveyer 88 to the hopper 90, then horizontal conveyors 96 to each cannon 50. A piston 64 is used to control a predetermined amount of projectiles to fall into magazine to be available for a cannon 50. The floor was slanted only toward the center line for recycling the projectiles rather than toward a center hole for collecting any paint and waste water.

U.S. Pat. Nos. 6,217,026 and 6,338,487, as well as U.S. Pat. app. No. 2001/0008329 describe a game system including a bullet-supply device for feeding back the shot bullet to a pneumatic gun and a communication line connecting the bullet-supply device to the pneumatic gun. The bullet-supply device feeds selected bullet to the gun without counting the number of bullet. The communication line is a hose with a chain therein to prevent the hose being twisted by the movement of the player. The system employs a sensor to ensure the gun is at the shooting position before actuating the gun is at the shooting position such that the player can freely move the shooting gun, rather than restrain the movement of the gun with the chain to ensure safety .

Currently, a more convenient system for transporting, managing, and cleaning a paintball shooting range is in need to expose new people to the sport.

#### **SUMMARY OF THE INVENTION**

It is a purpose of this invention to provide non-contact exposure to the sport of paintball while at the same time entertaining and presenting a challenge (the shooting range) to the participants.

It is another purpose of this invention to provide a more convenient system for transporting, and cleaning a paintball shooting range to attract more people to the sport.

It is another purpose of this invention to provide safer way to shoot paintballs via a paintball shooting range installed with non-human targets.

It is another purpose of this invention to provide a system for easily managing the dispensing of paintballs so as to charge fee accordingly.

It is another purpose of this invention to allow manufacturers to actually let consumers experiment with various prototypes (markers in particular) at trade shows in a safe environment by using the mobile/immobile Paintball Shooting Range.

It is another purpose of the invention to provide sales representatives of paintball marker manufacturers to travel with a smaller range loaded on a trailer to demonstrate and market the various markers and products to potential customers at their location.

It is another purpose of this invention to be used as a tool to help promote and market paintball as a sport and entertainment as well as allow less adventurous consumers to participate without the possibility of physical harm.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The foregoing and additional features and characteristics of the present invention will become more apparent from the following detailed description considered with reference to the accompanying drawings in which like reference numerals designate like elements and wherein:

FIG. 1 illustrates a trailer for transporting a paintball shooting range according to the present invention;

FIG. 2 illustrates another trailer for transporting a paintball shooting range according to the present invention;

FIG. 3A shows the top view of a paintball shooting range according to the present invention; FIG. 3B shows the cross-sectional view of the wall taken from A-A line in FIG. 3A; FIG. 3C is a perspective view of a target subsystem of a paintball shooting range according to the present invention;

FIGs. 4A & 4B shows a top view and a side view of a shooting booth of a paintball shooting range according to the present invention;

FIG. 5 shows one embodiment of the marker powering arrangement of a paintball shooting range according to the present invention;

FIG. 6 shows a control panel of the marker powering arrangement of a paintball shooting range according to the present invention;

FIG. 7 shows a side view of a paintball dispensing subsystem of a paintball shooting range according to the present invention;

FIGs. 8A-C show a top view and two side views of the paintball dispensing subsystem in FIG. 7; FIGs. 8D-E show a prospective view and a side view of a turret/accelerator assembly (U.S. Pat. No. 5,431,410) adopted in the paintball dispensing subsystem in FIG. 7; and

FIGs. 9A-B show a top view and a side view of a cleaning subsystem of a paintball shooting range according to the present invention.

## **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

The paintball shooting system for facilitating the practicing or playing of paintball markers(guns) include, alone or in combination, range transporting subsystem 100, a target subsystem 200, a paintball marker firing subsystem 300, a paintball dispensing subsystem 400, and a range cleaning subsystem 500. In particular, the paintball shooting system 10 can be fixed in one location or moveable to different location by being loaded on a trailer.

The range transporting subsystem 100 includes a 12' X 30' trailer loaded with all other subsystems positioned in a predetermined manner in the enclosed space such that they can be easily transported and put into operation at any locations as one unit. Any commercial available trailer can be modified to transport paintball shooting system 10. For example, Cargo Trailer Engineering offers (at <http://www.haulmark.com/engineering/cargo1.asp> ) a model Elite II depicted in Fig. 1 which has a fiberglass roof cap 101 for styling and added protection of interior from weather (us patent no. D290,106), d.o.t. required lighting 102, solid steel front bows 103, heavy-duty roof bows 104, plywood interior walls 105, 3/4"

plywood interior floor 106, a galvanized roof 107 for protecting against weather and corrosion, aluminum fender flares 108, chassis 109 protected with rust-inhibited coating, load-matched tires and wheels 110, heavy-duty torflex axles with e-z lube 111, solid steel frames 112, strong side wall studs 113, frame-integrated tube tongue 114, couplers 115, and heavy-duty front jack 116 with easy-cranking mechanism for lowering and raising. As another example, Sundowner offers a support utility trailer model Bumper Pulls ( available at <http://www.sundownertrailer.com/products.php?model=SUTBP>) as depicted in Fig. 2 which is 6' 9" wide, 6' 6" tall, plywood floor with tread plate overlay, running boards, stainless steel hinges, hubcap trim ring with center cap, spare tire, aluminum skin , insulated walls, 2' tread plate nose wrap, led lights, inside dome light, full rear ramp to fit 6' 6" tall, camper vent, and framed and wired for AC. As shown in FIG. 3B, the trailer wall preferably includes an inner barrier netting full height wall/ceiling, a 1 ½" tubular steel frame, and a tarp/tent exterior wall/roof. As such, the target range is enclosed with the tent constructed with an 1 ½" tubular steel frame, the tarp outer wall encompasses the entire target range and contains a paint splatter, and the inner wall is made of a strong nylon mesh and will encompass the entire target range. The nylon mesh withers or breaks the balls. In particular, the steel frame has a flange base with a grounded attachment. In addition, the outside of the trailer is painted or posted with commercials of the paintball shooting range to market the range and the sport.

As shown in FIG. 3A, the target subsystem 200 is positioned at front end of the trailer and suitably configured to permit players to locate and identify the target area while addressing the paintballs from the back end of the trailer so that the players may land the paintballs within the target area. In addition, to facilitate the identification of the targets under conditions without external lighting, the targets 250 are preferably illuminated by a light 201. FIG. 3C shows eight columns and three rows of colorful targets 250 marked under 1-4 on a shelf 205 for four players. The target subsystem 200 could be any existing electric or mechanical types. For example, electric targets light up when hit, a siren sounds off when all targets are hit, and then are automatically reset. As another example, mechanical targets fall when hit and are manually reset. Different light colors and siren sounds are set for targets of different difficulty. Any shooting range target system or shooting game system known to one skilled in the art can be incorporated into the systems to encourage or entertain the players.

The paintball marker firing subsystem 300 includes a plurality shooting booths 310 (FIG. 4A) each having a pneumatic paintball marker 311, a support counter top 312, and partitions 313. Each pneumatic paintball marker 311 uses air for propellant and a loader to

feed the paintballs purchased for target shooting. Each marker 311 is restrained in a corresponding booth 31, and selectively connected to at least one air tank 320 via a corresponding air hose 321 and a valve/switch 322 for separately controlling each marker 311. A compressor and a regulator are provided between the air tank and the valve/switch 322 to accommodate the pressure difference therebetween. The partitions 313 can be made of any material strong enough to withstand impact of paint-balls. In one embodiment (FIG.5), five air tanks (e.g., CO<sub>2</sub>) are connected to a high pressure manifold 323 which in turn connected to the valve/switch 322 each of which is separately turn on/off by an attendant via a control panel 325 in FIG. 6. The control panel 325 has a set of electric switches 326 for controlling the dispensing of paintballs to each marker 311 (described later) and a set of pneumatic switches 327 for controlling the supply of air to each marker 311. As shown in FIG. 3A, the attendant enters the system via an entry 301 into safe area 305 which is protected by a full height netting 309. The netting 309 is installed for the attendant's safety, yet allows visibility for monitoring the players. Two attendants will operate the target range. One will remain behind or at the side of the booths to manage the paintball sales, air supply, and paint-cleaning. The second attendant will be out in front of the range to load the markers 311, maintain the markers 311, and provide instruction for the safe operations of the markers 311.

In addition to being tethered to the counter which confines the firing range to the target area, the paintball markers 311 are set at a velocity range of 0-300 ft/sec, and preferably 200 ft/sec which is 100 ft/sec slower than competition paintball and further assures containment. The partitions 313 divide each firing booth 310, which protects players from shooting at one another.

As shown in FIG. 4B, on the support counter top 312, each paintball marker 311 is provided with a U-shaped supporting seat 314 for resting the handgrip of the marker 311, and a restraining pipe. Each restraining pipe has a 6-16" (preferably 12") long tether 315 coming therethrough and a securing ring 316 at the end of each tether 315 to be secure to a barrel or a trigger frame of the marker 311 thereby restraining the movement of the marker 311 (e.g., to an angle of fire of 135 degrees) to point/aim only at the target area. The tether 315 can be made of a chain, a rope or a wire (of nylon, cotton, hemp, or other flexible substance). The movement of the marker 311 is further restrained by the air hose 321 connected to the end of the grip of the marker 311. Alternatively, the marker 311 can be electric or gas powered. Any existing paintball markers can be adapted for the invention.



At the left side of Figs. 9A-B, the paintball dispensing subsystem 400 comprises a reservoir 405 placed above the booths 310 for receiving and storing around 5,000 paintballs therein, and selectively dispensing the paintballs to a loader of each marker 311. The reservoir 405 has a sloped plate 410 placed above a deadspace. An air-conditioning unit 420 which keeps the paintballs at 18-24°C is placed in the deadspace. Alternatively, the reservoir 405 and the air-conditioning unit 420 are assembled into a removable unit for holding different volumes of paintballs for the prior art paintball systems to control the paintballs in a fixed range of temperature. The prior art did not offer such a system for any paintball tanks or paintball loaders.

At the lower end of the sloped plate 410, five ball dispensing mechanisms 425 are provided. U.S. Pat. No. 5,431,410 is incorporated by reference for its turret/ accelerator assembly 36 for receiving balls that fall by gravity. The ball dispensing mechanisms 425 of the invention are modification of the turrets by making smaller the center opening 60 thereof such that only a limited number of paintballs will fall into each turret/ accelerator assembly 36 at a predetermined speed. In FIG. 8A, each turret/ accelerator assembly 36 has a circumferential array of peripheral openings each sized to receive one of the balls as the ball dispensing mechanisms 425. Each turret is rotated about its axis such that balls that fall by gravity onto the turret/ accelerator assembly 36 are urged by centrifugal force toward a respective peripheral opening connecting to a flexible feed tube 430 (FIG. 8B).

A counter 435 (e.g., a micro switch, or an electric eye; FIG. 7) for counting the dispensed paintballs and a magnetic strip seal 440 (for a lid, a door, or an exit) are installed between the feed tube 430 and the loader of each marker 311 to count the dispensed paintballs. The section of tube connected with the loader is preferably clear with markings to show number of balls loaded. The marker 311 will not fire should the connection to counting device be broken or mal-functions. Players can purchase the paintballs in 25 ball increments to shoot a wide range of targets. As mentioned, the numbers of paintballs to be loaded will be controlled from the control panel to allow each marker to be fed individually. As explained later, the counter and the feeding system will be connected into a microprocessor to monitor total number of balls fed to the markers and the balls loaded to each markers. Prizes will be given for participating and additional prizes will given based on targets hits.

Referring to U.S. Pat. No. 5,431,410, Figs. 8D-E show a bracket 38 carries a flat circular base 40 in fixed position beneath and generally aligned with each opening 34. A turret 42 in the form of a flat circular plate is coupled to a shaft 44 for free rotation above

base 40. Turret 42 has a circumferential array of peripheral through-openings 46 at uniform radius from the axis of shaft 44, and at uniform angular spacing relative to each other around the circumference of turret 42. Each opening 46 is sized to receive a single one of the balls 48. A cylindrical wall 50 is mounted on base 40 surrounding the periphery of turret 42. A bracket 54 is affixed to wall 50, and extends radially inwardly therefrom so as to overlie the turret through-openings 46 as they pass in turn beneath the bracket 54, for purposes to be described. A conical funnel 56 is mounted by angularly spaced legs 58 in fixed position above wall 50. The outer diameter of funnel 56 is greater than the diameter of wall 50 and greater than the diameter of openings 34. Funnel 56 has a central opening 60 that overlies and is aligned with the center of turret 42 where it is coupled to shaft 44. Shaft 44 extends through a bearing 62 on base 40 to a pulley 64 beneath the base. A variable speed electric motor 66 with integral gear box 67 is mounted on bracket 38, and has an output shaft 68 that is coupled to a pulley 70. Pulleys 64, 70 are interconnected by a drive belt 72. Thus, turret 42 is rotated by motor 66 at an angular velocity that corresponds to the speed of rotation of the motor reduced by gear box 67.

The range cleaning subsystem 500 includes a transparent plastic sheet 505 placed behind the target subsystem and on the neighboring side walls for the paintballs to burst thereon, a fresh water holding tank 510 with a pump for pressure-water-cleaning the enclosed space, a floor drain 515 for collecting paint and waste water, and a floor 520 tapered from the bottom of the plastic sheet 505 toward the floor drain 515. Alternatively, a spray system sprays the target system and along each neighboring wall. The spray system can adopt any method to disperse water under pressure to cover area to be cleaned.

The electrical system of the invention may support not only the lights for booth/trailer, but also the markers so no batteries are used. The paintball shooting system is powered by a gas powered auxiliary generator. The markers 311 (usually running on 9V batteries) are modified to run on 120V, 240V, or the like which work in conjunction with a transformer. A router, a switch, or a power split is needed if an external power source is available in addition to the internal generator of the system. In the prior art, no markers operate while plugged into an electric supply other than a battery.

Optionally, a microprocessor or a computer is connected to each subsystem or component systems including but not limited to feeding system, cleaning system, tethering system, air system, target system, advertising, gun system, cooling system and power generation system, to locally or remotely monitor and diagnose the performance of each

component system, to collect data from all component systems, to audit controls for operation of all systems, to download of changes in operating controls for all component systems, to provide help desk for operations for all component systems, to provide training for all component systems, to provide infomatics on all component systems as compared to general database.

Optionally, a scoring subsystem is added into the system to record the score of each player and display for the attendant and/or the players.

The principles, preferred embodiments and modes of operation of the present invention have been described in the foregoing specification. However, the invention which is intended to be protected is not limited to the particular embodiments disclosed. The embodiments described herein are illustrative rather than restrictive. Variations and changes may be made by others, and equivalents employed, without departing from the spirit of the present invention. Accordingly, it is expressly intended that all such variations, changes and equivalents which fall within the spirit and scope of the present invention as defined in the claims, be embraced thereby.